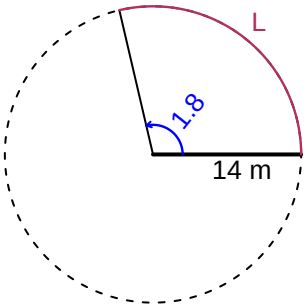
Name: Date:

Trig Final (SLTN v623)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 14 meters. The angle measure is 1.8 radians. How long is the arc in meters?

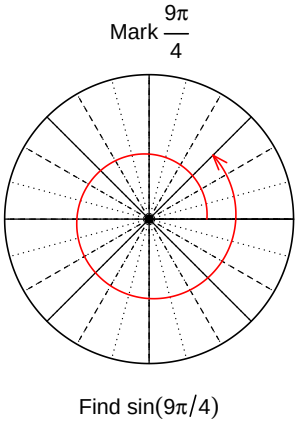


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

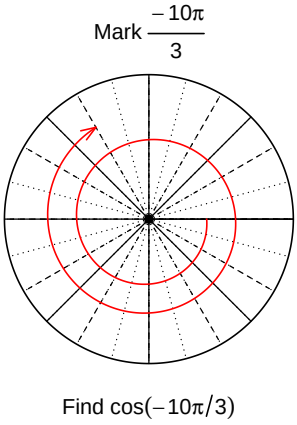
$L = 25.2$ meters.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(\frac{-10\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(9\pi/4)$



Find $\cos(-10\pi/3)$

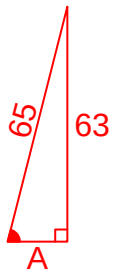
$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-10\pi/3) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{-63}{65}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

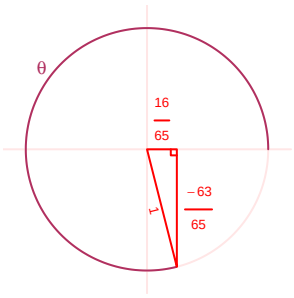
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-63}{65}}{\frac{16}{65}} = \frac{-63}{16}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 3.84$ meters, an amplitude of 6.94 meters, and a frequency of 8.91 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.94\cos(2\pi 8.91t) + 3.84$$

or

$$y = 6.94\cos(17.82\pi t) + 3.84$$

or

$$y = 6.94\cos(55.98t) + 3.84$$